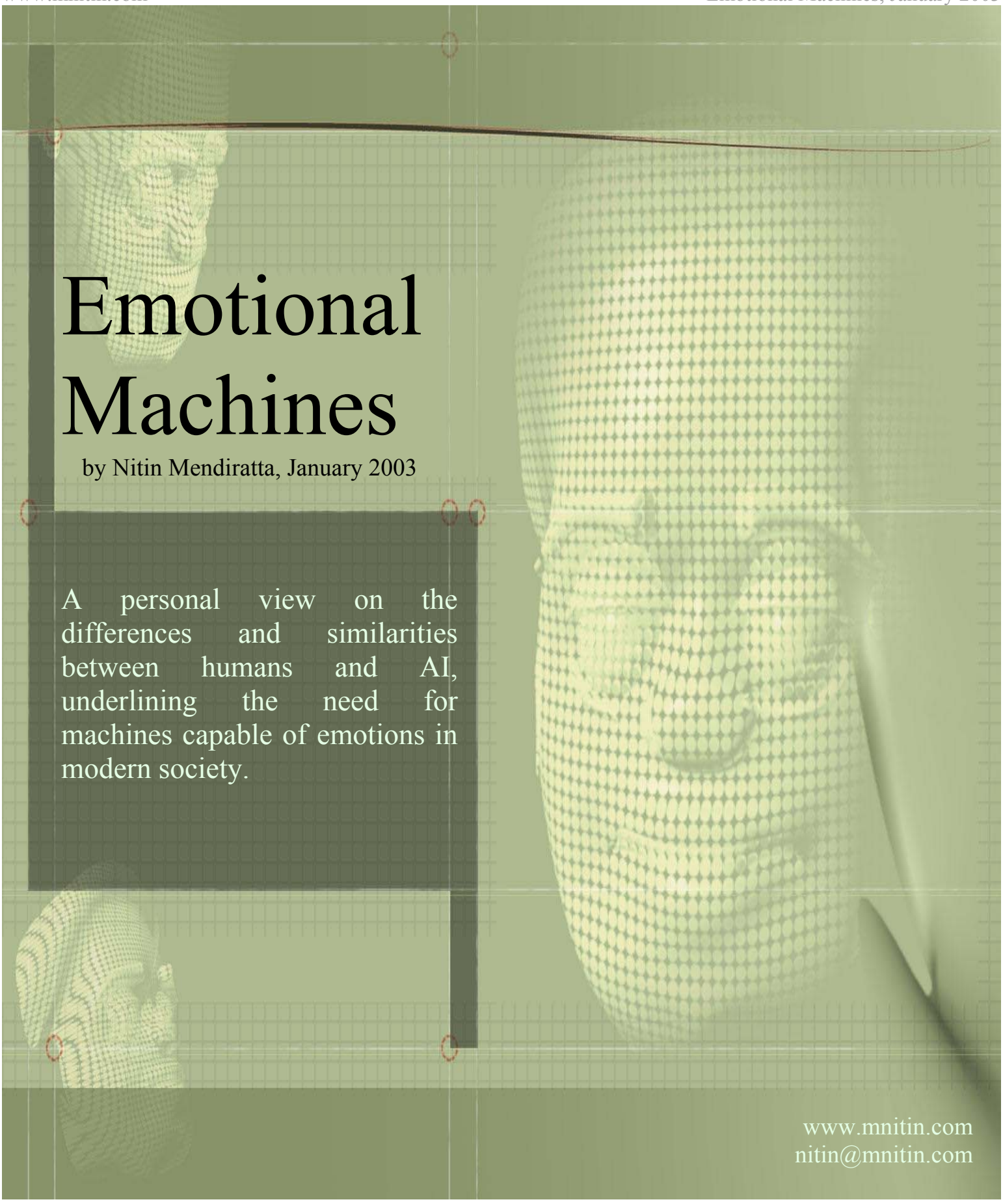


Emotional Machines

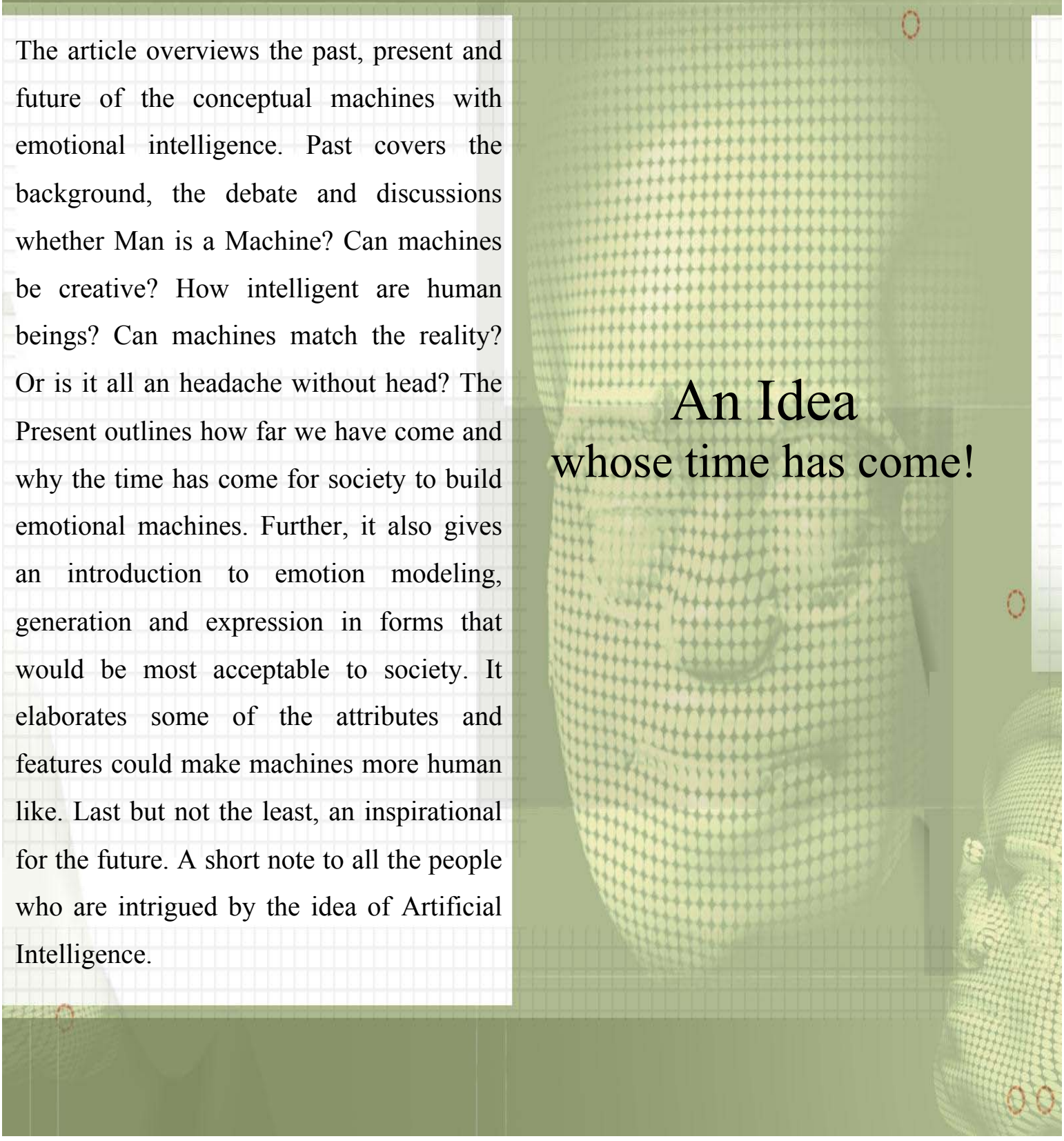
by Nitin Mendiratta, January 2003

A personal view on the differences and similarities between humans and AI, underlining the need for machines capable of emotions in modern society.

www.mnitin.com
nitin@mnitin.com

Emotional Machines

The article overviews the past, present and future of the conceptual machines with emotional intelligence. Past covers the background, the debate and discussions whether Man is a Machine? Can machines be creative? How intelligent are human beings? Can machines match the reality? Or is it all an headache without head? The Present outlines how far we have come and why the time has come for society to build emotional machines. Further, it also gives an introduction to emotion modeling, generation and expression in forms that would be most acceptable to society. It elaborates some of the attributes and features could make machines more human like. Last but not the least, an inspirational for the future. A short note to all the people who are intrigued by the idea of Artificial Intelligence.



Introduction

Today, people are interacting more and more with computers. Life is running at a microchip speed. If all computers are stopped for a day, complete civilization comes to a halt! Fifty years ago, this might've been a science fiction, but today it is a reality. Further, with Computers being embedded in all of our life accessories like mobiles, watches, cars, even our bodies and brains there is no indication that this microchip speed will not be multiplied in the future.

Over the last decade, these electronic tiny minuscule signals have fundamentally revolutionized the way we live. People are spending more hours per day with machines than humans. An amazing a human-machine relationship is developing. So far this bond has been one sided because the ability to generate, recognize and express emotions are a unique prerogative of living human beings. If this intelligence or abstract attribute could be taught to machines, it would re-conceptualize the perception of machines. It will fundamentally change the way we will life, in the third millennium.

We taught machines how to read, speak and understand humans by voices, actions and events. Now we are fast approaching a stage where we will have to impart intelligence to make these non biological machines a part of living beings family. Further, diminishing the difference between living and non living, biological and non biological. The intelligence attributes could be Emotions, Creativity and Spirituality. Society will not restrict scientists from migrating human into machines because eventually most of the people will want the indefinite life span and better services from these machines with increased intelligence. And also a new ability of machines to change with time and users.

Internet is converging all the specialized fields or colors of knowledge into one bright light. The avalanche of new users getting online is still growing. People from all across the planet are spending more and more hours surfing the net, especially in chat rooms, use net groups and bulletin boards. Chat Servers are the unique platform where interactivity the intelligence and interactivity of humans and machines coincides. There have been some heroic individual efforts to realize chat bots, who would talk and behave like humans. If this is any indication of people's openness to talking and sharing emotions through and with machines, then we are seeing the tip of the emotional machine iceberg.

Background: Is man a machine?

Is Man a Machine? A Robot? Doctors see man as a neurological and biological system. Mathematicians consider man a collection of logic and computational devices. Intelligent Computer Experts call them interactive robots. Artists see human as a God, while some just as Animal. Computers are Computing Machines. Computation work is done by making relations. Computers Compute, The best possible relation to do a particular task or process. Is thinking just making relations? Is thinking an art or science?

Grandfather of computers, the calculators were basically invented to assist calculations. Now days, Super computers with AI (artificial intelligence) algorithms, try to imitate the logical working

of human brains. Thinking refers to a huge abstraction, an infinite circle whose circumference englufs everything and who's center is in every human brain. Most of today's application is just superficial application of logic developed by the human's way of doing things. Such manifestation of logic implementation may not be regarded as thinking... Because, these hardware components don't actually have any idea of what is happening. They are just action-reaction machines; they are dependent on events to happen.

Taking information, decisions and ability to learn can be regarded as thinking. For all such activities, we need to logical operations like compare, duplicate, store, calculate, remember and order. Yes, computers can do all this! We see numerous demonstration of this ability in software applications and internet portals. Comparison is also the key which opens the door of emotions in our mind. Comparison with others, our past which makes us happy, sad or even jealous.

Can machines be creative?

Thinking leads to creativity, something which can generate myriads of emotions in mind and soul. Can these computers generate that creativity in themselves? They might've beaten Gary Kasparvich once, but will they be ever able to match the genius of Einstein? Can they create such wondrous theories? Can they create paintings like Picasso? Can they deliver some beautiful thinking philosophies or Karl Marx, Mahatma Gandhi? Creativity requires some magical gift, which can not be explained by logical disintegration.

Some intelligent technocrats may argue that beauty or creativity is in the eyes of beholder. A new born baby is independent of emotions likes and dislikes. A man in solitary confinement, if given some Chinese letter alphabets, would not be read, speak or write Chinese. Emotions are not at the core, they are governed by instincts. Which are induced in us by family, society, culture and life style around us. What may be beautiful to me may not be beautiful to you. As we all are from different works, family, cultures, so that governs my aesthetic sense. "Jingle bell" would make a small child happy in US of A, but not in Afghanistan. Society programs our thinking and feeling.

Then why the masterpieces of creativity, Beauty, say Taj Mahal or even Cindy Crawford is beautiful for every person breathing on this planet. Art, lives through the centuries, they never die. Why? Is it because we have been told that Taj Mahal is beautiful? Isnt it as beautiful to youn as it is to me? Are those men who go big drooling "awww "over Cindy Crawford, have been programmed to do so? It comes natural, just sources of thought are not just instincts but some what deeper in how the brain works.

Is it possible for any machine to replace the joy of watching the master batsman Sachin Tendulkar hitting six runs on Shane Warne's googly, or Michael Jordon slam dunking or Tiger woods or the Mozart or Chess Champ Gary Kasparov?

Everyone in this world is not equal because of come combination of skills. These skills are developed by the finer aspects of family and social environment. These different combinations are independent sources of creativity and thinking. If we provide equal, will it breed same level of intelligence? Are two wins in a family eating same food, getting the same social environment equally

intelligent? Do they think a like? It is not unpopular to see people coming from different parts of the world sharing same views, thoughts and behave in common patterns. We try to decompose the level of abstractions, by better and better ways of our technical expertise and information gathered over the years. Just like a small child, we human beings are learning new ways to arrange and re arrange natural wonders and are hoping that this would accidentally some day help us decipher the secret of nature.

How intelligent is man?

Our ancestors named the genius who knew all these abstractions as God. Can we find another name to it? How many years will it take for the mankind to get closer to that name? With in a century, Genetic engineering will enable us to manufacture ourselves just like we have car factories. But will these two individuals have same level of intellect and vision? Who hasn't heard of Great Physicist Stephen Hawkins, How is biological state of man related to intelligence?

In science, math's the vast majority of theories works on the hypothesis. For what is force? - That moves the mass and for what is mass? that is moved by force. It is a sea saw. What is 2/2=1,1/1=1;0/0=?;infinity/infinity=? Science and Math's are just a belief like religion; no doubt it has attained great heights. We do owe a great respect for these postulates because they have greatly assisted mankind reach this level of communications and luxury. But in a wider perspective this possibility appears to be a headache without a head.

Some sequential tech code of database connection or algorithmic network theorems, saying do this, do that and wait until that happens. All these pseudo codes of modern day programming languages do what is needed. But these intelligent programmers determine, if or whether it is needed? Even a simplest imitation of a human reaction, would take a million, billion and trillion of years. Without any "illegal operations, close or shutdown windows.

What is thinking? How does brain works? How are the thoughts processed into actions? If scientists don't even know how exactly the brain works? How can the replicate the behavior or working of the brain? If a machine can't really think a situation, rather just act in a sequence of actions programmed; so, since we are progressing only from a single perspective. And this is not thinking. We can never determine if we are on right track if we do not analyze from different perspectives.

May be one can tell what he/she can or can not do, But can one predict what he/she can not do? Or what he/she is going to do tomorrow morning? Is it comprehensible to calculate this permutation and combinations of infinite possibilities? Every word meaning is depends upon the readers or listener's mind. So, how can these so called scientific things claim to create replica of William Wordsworth? Are these just castles in air? or wishful thinking? Or Just Bad Psychology - The human wish of being the originator, the creator.

Reality and Emotions

A teacher asked, "How long is one minute?". Student replied, "It depends on which side of the toilet you are!". Now isn't this real? Will it be possible to totally remove the human intelligence factor in the future? Can a computer understand anything real, what a one rupee or one dollar is, it

only knows the electronic circuits. But is also a fact that people fear technology. The fear of unknown. Just like our grandmothers get afraid when it comes to switching channels or playing games on computer.

Humans have a very wide range of emotions. Can we define each emotion? Is it possible to a non human to differentiate between disappointed and sadness? Is it possible to create a help book by defining all emotions? Can emotions be defined? Can it be related by readers? How can we explain an emotional condition or state? Are emotions generic or individualistic? A single act can generate different emotions in different individuals. How far is the dependency of emotions to individual only to his cultural back ground? What factors like current environment or state of activity around? Emotions like confused, happiness, sadness, anger can be easily related to but what about others? the mixed emotions? Happiness during fight is not possible, However a ironical, humorous sarcastic remark is possible? Sometimes, people remark which has a reference to an event or happening in the past. How will a machine decipher that?

How will the people react to such machines? When human beings hunt for animals, kills them, eat them... How will humans behave if machines become emotionally sensitive? How far will this injected intelligence take machines? will they make our car a horse? What is the limit?

Wonder if this subject is like which came first, egg or the hen? Anyways, There is nothing wrong with in this debate yet. The nature of being is tobelieve what we expect to believe, and to perceive what we believe is true. But perception is based on the senses so we will not succeed in creating "human-like" machines until we can expect it as a truth. Likewise, our approach is correct until we perceive it as false.

In a crowded movie theatre, while watching a movie, one gets wrapped up in the story as if it were really happening, and this is referred to as a suspension of disbelief. The longer the suspension, the more real it is. When the general public ceases to disbelieve the robot, then we have begun to succeed. The reorientation of growth and development of living and non-living be in one direction. In future, Will robots become a part of us, rather than one of them?

Till then, The Argument Will Continue...

Reality check:
Is it a head ache without a head?

Once there was a stump of tree, and in the dark a thief came that way and said, "That is a police man". A young man waiting for his beloved saw it and thought that it was his sweetheart. A child who has been told about ghost stories, took it for ghost and began to shriek. But all the time it was a stump of tree.

It is the purpose of the intellect to give us a detached view against which we can assess the objective clearly and decisively. To some extent it is in the nature of technology to narrow our vision and give it focus. Tragedy comes when we forget that these limitations and that the intellect can comprehend things as whole. For many centuries, scientists worked their theories believing sun revolves round the earth. Only later to be realizing it was exactly the opposite.

Technology views world through a slit. When a cat walks by it observes the eye, the fur and then the

tail, and then it infers that the eye is the cause of the tail - unless the course the cat was walking backwards. If this sounds absurd, some of the theories about the biochemistry and behaviors use very similar reasoning.

Some one would object, "why don't you open the door?" that's just your black cat pacing back and forth? but instead we usually get caught up in classifying slit information, even though without a larger view of our conclusions may be wrong. To make things worse, we specialize. We call it specialization. Often we do not even talk look through a slit, we sub and sub divide the slit! My field is the upper part of the tail, yours is the lower. He might've forgotten about the eye and fur. If anybody asks how the eye fits in, He would refer to him to another researcher, after all what eyes have got to do with fur?

What it requires is to open the door; then the argument becomes unnecessary. Once the door is opened, even a little, we will not quarrel over whose slit is correct and whether we should confine ourselves to the top or bottom of it. As long as we see only a part of the picture, logic and argumentation can never settle an issue. When the intellect becomes calm and clear, theory gives way to the demonstration.

Although the concept of an emotional machine is day by day becoming more convincing and compelling but the concept is very raw. The idea needs to be turned and looked upon from various different sides, examined carefully, analyzed, re-analyzed, polished and delivered again. Success needs as much attention to the means of work as to its end. Our defect in vision is that we are drawn so much to the ideal, the goal is so much enchanting, so much more alluring that we lose sight of details altogether. It is just like pottery. If the idea is stronger, it will carry the resiliency later. The shine and enthusiasm is there; the means are some how later, deeper, after processing.

Concepts are conceived and driven by the needs, nature and human behavior. Society supports all the concepts, which become followers of economy or progress. The great industrial revolution was flourished by mechanical ideas of machines of developing how things would work and what machines could do to improve our lives. Today, we are involved in the technology that will take us soaring further, again upwards and towards the top!

Overview: Building emotional machines

An emotional machine can be described as software or a hardware that can recognize, express and even generate its own emotions. The purpose is to understand the behavior of machine user(s) and accordingly facilitate an emotional smoother and more intuitive interaction with him. Basically its a robot, that is empowered to understand the mental state of a user and interact in a more sensitive way. However it is not easy to dissect human behavior and to build objects that would perform operations like:

if (user) == sad then offer(coffee) and play (blues!)
else ask("howdy man?! whatsup?);

Every human being is dynamic in interaction; every set of action can correspond to thousands of possible variables. Further, there are different cultures and individual factors, which have interestingly kept this "emotional" aspect of human behavior abstract. Modeling emotions or emotional states could be very challenging. Even modern day

disintegrating paradigms like object oriented thinking, or the traditional school of Psychology and human behavior have failed to categorize emotions into type and categories. However, on the basis of actions-reaction, these emotions can be understood in the form of layers. The interaction may not offer a complete solution but will definitely reduce complexity to a lesser difficult variable arrays. The arrays should be generic and independent of situation, context and cultural background and environment around the particular user.

Why emotions?

We feel that we are alive because of emotions. "I think therefore I am" and "I feel therefore I am". The gratification of "I" of is the popular reason for living. The most popular, famous and well respected personalities in the world so far have had a rich expressions, subtlety and complexity of behavior and highly emotional thoughts. Since industrialization, there have been many researches to strengthen this marriage of machines and human life. All those researches which have made man, make optimum utilization of the abilities of machines Like high productivity, quality focus, multi purpose, multi user approaches have been very popular.

Modern day life style has created a lot of pressure on human brains. They say," Talking " can reduce mental stress and strain. Cyber friendships, becoming real life friendships, even marriages are not unpopular. And in fact the open debate on cyber laws, cheating on net, shows that the so called "Virtual Reality" of yesterday is actual and part of the reality today. Interesting point to be noted here is that this is all effect of plain exchange of textual words. By Ordinary People, With Ordinary for ordinary people. Wonder what capabilities will an scientifically engineered emotional machines could do?

Irrespective of the age, all human beings are well committed to living life as a journey of emotions. Materialism, Religion, Emotions, Spirituality through music, and dance. everyone has read the stories where by religious healing(spiritual, emotional). Exchange of words transformed a person from a murderer to an angel. Which even a modern day medicine science has failed to do so. One important advantage that machine have over humans is that of memory. These machines will recognize the pattern of thinking and cognitive functions of human behavior. Past is either remembered or forgotten. If forgotten, there is no possibility of recovery and if remembered, there are no error correction or detection methods.

In Internet Chat rooms, mere typed words in black and white have been constantly stimulating myriads of emotions. Many people are programming bots which would imitate a human like talking and conversation skill and look real. So far the bots have impressively performed in controlling or managing the chat groups. Their performance has been as impressive as any human would do the job. However, this is controlled environment, and where they do only a limited task. So far they have failed to pass the Turing test of human intelligence.

The social need

Man is a social animal. People make relationships due to this social reason; they make them feel good about themselves and about the world and living. Never before the world had such sophisticated medical equipments, so many hospitals and qualified doctors. But still world today has more diseases, ill person than ever before. Why? its all

in the mind. The increasing social insecurity and lack of communication. The education they give in schools and colleges is for earning money. It is not the education on how to live. The human values, spirituality, emotions can be better taught through machines, because some how people reached a good level of understanding and comfort with computers. Let us analyze the social needs age group wise:

Adolescent Age Group of 8-16 years: The Conflict here is that of Identity Vs Role confusion. Strong efforts to get answer "Who am I"? They also attempt to establish their own identity and think of themselves as separate from parents. They look for support, guidance and an identity to relate with. There is also a Conflict of industry VS inferiority. Important event is school. At this age, the only source of pleasure is of a "job completed!!" Children need to be productive and do work on their own. They are physically and mentally ready to do work for it. Interaction with peers also play imperative role for a wide variety of events like academics, group activities and friends. Difficulty with any of these can lead to sense of inferiority.

Adult hood - Age 16-34 years: Conflict here is for intimacy and isolation. Important events: love relations. Here, important events are love relationships and intimacy. It refers to one's ability to relate to another human being on a deep personal level. Most of the people in these categories have not developed a sense of identity, fear of being a misfit. These people are willing to be open and committed to jobs, and challenges.

Grand Parents, Age 65+. Conflict: integrity and despair. Important event: reflection on and acceptance of one's life. The important event at this stage is to accept one's whole life and reflecting on that life in a positive. They want to achieve sense of integrity that is coming in terms with death. Accepting responsibility for life and being able to undo past and achieve satisfaction with self is essential. The most positive out comes here is the sense of fulfillment of life and accept death as unavoidable reality. Most of the people in this age group are not able to obtain feeling of fulfillment and completeness with despair and fear death.

Further, there are different emotional modes of human interaction, like ordering a sales clerk, is different than the relationship we have with our mother. Such communication is very formal, like an act and can not induce emotions. The first step is to create an environment, which has a feel easy factor for everyone. It is easy to connect with the inner consciousness of a person when he is at the comfort in his home, than in a formal public gathering. Therefore if there is responsive machine which can be personalized as per the mental state of the user, it would make everything more meaningful and alive in the world.

How can machine generate emotions?

Literature, Art, Dance, Music are all forms of emotional expressions. They can also be a source to induce emotions, and perhaps in combination with Pictures and Video even make a person relive the experience. Pen is mightier than the sword. Sometimes written and spoken text is so powerful so much enchanting that it creates a illusion around a person. Its all in the mind, they say. Stories and miracles in which Doctors, Saints or Psychologists have healed the ailing person. Just by verbal communication. So far the internet has been like

radio, one way broadcasting. Slowly and gradually it will be the 100% interactive medium of entertainment, fun and leisure.

One on One talk immediately generates emotions. According to many internet surveys, Chatting for is the biggest reason why people get online. Gratification of wants/needs for happiness and pleasure is a social want, in fact a need. Further, there is a lack of human-human interaction in modern society. Some one who can promote and spread the message of good communication, revitalize the good values of communication, heart to heart talk and virtues from upfront would be appreciated.

How to model and express emotions?

Chat bots are small stepping stones towards building anything close to an emotional machine. So far the bots are only able to understand emotions that are expressed by words or short sentences. Like "Hello!", "How are you?", "I don't like you", this is step is just like the "hello world!" in programming language or single words.

May be emotions can't be categorized, but they can be understood like colors. All colors are made out of Red, Blue and Green. Perhaps with more than just 3 basic colors, we can generate a hierarchical tree for mapping human emotions and predicting behavior. If we add self learning ability to bots, then capabilities and efficiency would increase manifolds. If a bot is able to outsmart human curiosity and make a big illusion, it will conquer the unreal or non living factor related to machines.

Characterization is an important aspect. In world of computers, there have been many efforts to shape up machines. Characterization facilitates easy and interactive way to understand and accept information. One can observe a conscious effort for this direction in MS Office assistant, Web Monkey, Japanese Pet Robots etc. However, the characters should be easily related by everyone, from Great Britain to South Asia.

How to make machines more human like?

In listening, facial expressions and body language can be of great help in understanding emotional state of a person. However, people have different personalities, they may think, react, behave, speak or feel different as same time, or same at different times.

The quality of experience that a person has while talking to a bot is a function of that person's behavior plus the resulting behavior of the responsive mechanism. Obvious exceptions to these are the robots that do monologs or that are otherwise unresponsive to what the person says or does. A very proactive response mechanism depends more on the content of proactive element, and less on the person since the person's choices are usually limited in bot proactive situations. So depending upon what the person does, he may or may not have a satisfactory experience with the robot.

The expectations, The requirement and the purpose of the designed responsive system should be clearly defined. Does the person expect a will smith or a priest or a funny joker? Bots can only decipher words or in very short sentences. Human experiences, knowledge, age, intelligence's, specific subject, domain expertise and human interest can affect the dept to which a person may

be able to engage the bot. External Environmental Factors that could effect human-bot conversation are disturbance, duration of chat, accuracy, quality of information exchanged, distraction and interface of interaction that exists between the two.

Ways to make a conversation more stimulating

A little conflict in conversations, if artificially induced can work as steroids. Conflict allows evaluating and helps in avoiding conformity. A little disagreement marked by a bit of tension, leading to compromise on selected ideas or alternatives and finally reaffirming a closure of the issue by a reaffirmation of support. All the while, communication should jump back and forth between three tracks - task, topic and relation. Topic means the specific item that is being discussed. Relation is the interpersonal relation that has been created till that time. Sometimes, a small conflict strengthens the relationship. With a non withdrawing, careful and prepared appropriate text. if time permits, every discussion can happily end with an immediate resolution.

Topics for discussions should be selected very carefully. Topics are chosen in a strategic fashion, which can help us evaluate, control, judgment, superiority and neutrality of each user. The focus or main attention is to be paid to the main task or question in hand, whereby user can communicate on topic, openly and honestly with spontaneity. Such presentations will make any user understand replies better and generate willingness to talk more. For a long term communication a detailed and well elaborated collection of information is required, which can help in predicting the future questions and answers.

The future – One must read

Classic Critics and Traditional School of Thoughts share an unshakable believe in the "survival of the fittest". Their dominant ideology, a business version of Charles Darwin's theory of evolution is that the strong and large will endure - the small and weak will perish! Big fish will always devour little fish. Over the years however, individual genius in close concert with technology has often upset this primordial balance. Some little fish not only survive! They excel!!

More to the point, their chances increase exponentially when their environment gives them an advantage. In this fish pond of information technology that we call WWW, the World Wide Web, little fish have the environment as their strongest ally! In fact the big fish are in real danger, of going the way of dinosaur if they DO NOT learn to adapt!

As they flew above the grassy slopes of Kitty Hawk, in their first awkward looking airplane, the Wright brothers had a little comprehension about the real magnitude of their invention. In fact the skeptics were in abundance, proclaiming, flight to be the foolish past time of dreamers, and carnival performers, with no practical value, and certainly NO commercial importance. The atmosphere above our planet was a realm for childish! And they were told NOT TO by experienced people. Their seniors like ours, believed that "old traditional ways" were the "BEST"

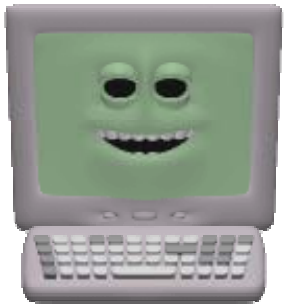
The Wright Brothers were forced to use vision and genius, without the comfort of any empirical data to rely upon they had no professional that their

flying machine would even work, and even if they flew, they had no reason to think anyone would care, let alone, actually purchase their product. The same can be said about Edison, Graham Bell, Marconi and yes even Bill Gates. No one thought that their individual brilliance, that their intellectual offspring would change the world. They were also little fish with a technological advantage and their impact continues unabated to this day.

At their inception, the airplanes, the electric light, telephone, radio and even windows operating system were considered gimmicks, fads and foolishness. They were considered interesting, even exciting for a moment, but with no lasting significance or impacts, the big company executives. fat and says in the palatial offices, saw these new comers as mere annoyances, momentary interruptions in the "lasting dominance" of they Mercedes cars, buggy whips, candles and manual calculators. It was a classic example of myopia created by size and complacency and it was catastrophic miscalculation.

To a much lesser degree that we enjoy today our predecessor's environment was on their side as well technology was expanding, although not with the microchip speed of today. Internet is epicenter of a commercial shockwave that is destined to change everything we think, we know about working and behavior. The group of entrepreneurial visionaries of the Artificial Intelligence will be the ultimate beneficiaries.

This is just my opinion, of course... other knowledgeable people may disagree!



Questions?
Sugesstions?
or just want to
say "Hello"!

Please, write in to me at:
nitin@mnitin.com

I guarantee you a reply, often on the same day! :)